REMARKS

Claims 1, 6, and 11 have been amended. Claims 1 through 19 remain in the application.

35 U.S.C. § 101

Claims 1 through 19 were rejected under 35 U.S.C. § 101 because the claimed invention is allegedly directed to non-statutory subject matter. Applicants respectfully traverse this rejection.

As to inventions patentable, 35 U.S.C. § 101 provides that:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The plain and unambiguous meaning of Section 101 is that any invention falling within one of the four stated categories of statutory subject matter may be patented, provided it meets the other requirements for patentability set forth in Title 35. A patent cannot be held invalid under 35 U.S.C. § 101 pursuant to so-called "business method" exception to statutory subject matter, since business methods are subject to the same legal requirements for patentability as any other process or method. State Street Bank & Trust Co. v. Signature Financial Group Inc., 47 U.S.P.Q.2d 1596 (Fed. Cir. 1998).

Claims 1 through 19 claim a method of emulating machine tool behavior for a programmable logic controller logical verification system for manufacturing a motor vehicle. As such, the method is useful and is one of the statutory categories of patentable subject matter. The method of the present invention therefore has utility. Contrary to the Examiner's opinion, the method is not an abstract idea or carried out on paper. The terms used in the claims are

interpreted in light of the specification. In addition, claims 1 and 11 have been amended to include using a computer. As such, claims 1 through 19 require a computer and are <u>not</u> abstract ideas or mental steps. Therefore, it is respectfully submitted that claims 1 through 19 are allowable over the rejection under 35 U.S.C. § 101.

<u>35 U.S.C. § 103</u>

Claims 1 through 19 were rejected under 35 U.S.C. § 103 as being unpatentable over Kanai et al. "A Virtual Verification Environment for the Sequence Control System Using VRML and JAVA", 1999 by ASME, pgs. 1 through 8 in view of ThermaView "ThermaView Advanced Welder Diagnostics System", 1998, pgs. 1-2. Applicants respectfully traverse this rejection.

Kanai et al. discloses a virtual verification environment for a sequence control system using VRML and JAVA. Sequence control is one of the key components of realizing the various kind of current automated factory equipment. Building the system components in the equipment and programming the control code in a PLC are two major activities in developing the sequence control system. VRML2.0 was originally designed as the standard specification language of 3-D geometry and its dynamic behaviors. It can be executed on any platform and any operating system. There are many VRML viewers and authoring tools commercially available, and they are much less expensive than the commercial discrete-event simulators. The specification of VRML includes the behavioral mechanism of the scene based on the event cascade. The execution engine is also installed in all VRML viewers. The language format is specified as the ISO/IEC international standard. The language can be executed in any operating system, and can be easily imported through networks. Generally, the sequence control system can be modeled as a set of finite state machines. State variables, input variables, and output

variables of each component model can be defined as fields in the prototype node of the VRML. The state transitions of each model can be also described in the script nodes by combining the external JAVA code with the VRML. 3-D geometry of the components, their motion behaviors corresponding to the state transition of the component can be easily defined by adding the several standard nodes of VRML in the code. Inexpensive VRML viewer can be used for the visual verification of the co-simulation. Kanai et al. does not disclose the steps of generating transformational arrays for a mechanical model using a computer and viewing motion of the mechanical model in a motion viewer based on the transformation arrays using the computer. Kanai et al. also does not disclose the steps of replicating a motion of a mechanical model by generating a PLC code for the motion of the mechanical model if the motion of the mechanical model was acceptable and using the accepted motion of the mechanical model to compare the behavior of the PLC code relative to the accepted motion by playing the PLC code with a PLC emulator.

ThermaView discloses an advanced welder diagnostics system. FIG. 5 illustrates a dynamic PLC display to isolate faults. A PLC emulator allows one to select a welder condition and then see a representation of the correct PLC state for that condition. ThermaView does not disclose the steps of generating transformational arrays for a mechanical model using a computer and viewing motion of the mechanical model in a motion viewer based on the transformation arrays using the computer. ThermaView also does not disclose the steps of replicating a motion of a mechanical model by generating a PLC code for the motion of the mechanical model if the motion of the mechanical model was acceptable and using the accepted motion of the mechanical model to compare the behavior of the PLC code relative to the accepted motion by playing the PLC code with a PLC emulator.

In contradistinction, independent claim 1, as amended, clarifies the invention claimed as a method of emulating machine tool behavior for a programmable logic controller logical verification system for manufacturing a motor vehicle. The method includes the steps of constructing a mechanical model using a computer, generating transformational arrays for the mechanical model using the computer, viewing motion of the mechanical model in a motion viewer based on the transformation arrays using the computer, and determining whether the motion of the mechanical model is acceptable. The method also includes the steps of replicating the motion of the mechanical model by generating a PLC code for the motion of the mechanical model using the computer if the motion of the mechanical model was acceptable and using the accepted motion of the mechanical model to compare the behavior of the PLC code relative to the accepted motion by playing the PLC code with a PLC emulator. Independent claim 11 is similar to claim 1 and includes other features of the present invention.

The United States Court of Appeals for the Federal Circuit (CAFC) has stated in determining the propriety of a rejection under 35 U.S.C. § 103, it is well settled that the obviousness of an invention cannot be established by combining the teachings of the prior art absent some teaching, suggestion or incentive supporting the combination. See In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 227 U.S.P.Q. 657 (Fed. Cir. 1985); ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 221 U.S.P.Q. 929 (Fed. Cir. 1984). The law followed by our court of review and the Board of Patent Appeals and Interferences is that "[a] prima facie case of obviousness is established when the teachings from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art." In re Rinehart, 531 F.2d 1048, 1051, 189 U.S.P.Q. 143, 147 (C.C.P.A. 1976). See also In re Lalu, 747 F.2d 703, 705, 223 U.S.P.Q. 1257, 1258 (Fed. Cir. 1984) ("In determining whether a case of prima facie

obviousness exists, it is necessary to ascertain whether the prior art teachings would appear to be sufficient to one of ordinary skill in the art to suggest making the claimed substitution or other modification.")

None of the references cited, either alone or in combination with each other, teaches or suggests the claimed invention of claims 1 through 19. Specifically, Kanai et al. merely discloses a virtual verification environment for the sequence control system using VRML and JAVA in which a sequence control system can be modeled as a set of finite state machines and state variables, input variables, and output variables of each component model can be defined as fields in the prototype node of the VRML. Kanai et al. lacks the steps of generating transformational arrays for a mechanical model using a computer and viewing motion of the mechanical model in a motion viewer based on the transformation arrays using the computer. In Kanai et al., the model of components includes the state transition and geometry, but does not include transformational arrays for the model that are generated. Kanai et al. also lacks the steps of replicating a motion of a mechanical model by generating a PLC code for the motion of the mechanical model if the motion of the mechanical model was acceptable and using the accepted motion of the mechanical model to compare the behavior of the PLC code relative to the accepted motion by playing the PLC code with a PLC emulator. In Kanai et al., there is no PLC emulator to play the PLC code such that the user can observe the motion of the mechanical model using the actual PLC code as if they were watching a machine or manufacturing line of a vehicle assembly plant floor. Therefore, Kanai et al. does not perform the steps of replicating a motion of a mechanical model by generating a PLC code for the motion of the mechanical model using a computer if the motion of the mechanical model was acceptable and using the accepted motion of the mechanical model to compare the behavior of the PLC code relative to the accepted motion by playing the PLC code with a PLC emulator as claimed by Applicants.

ThermaView merely discloses an advanced welder diagnostics system in which a PLC emulator allows one to select a welder condition and then see a representation of the correct PLC state for that condition. ThermaView lacks the steps of generating transformational arrays for a mechanical model using a computer and viewing motion of the mechanical model in a motion viewer based on the transformation arrays using the computer. In ThermaView, there are no transformational arrays. ThermaView also lacks the steps of replicating a motion of a mechanical model by generating a PLC code for the motion of the mechanical model if the motion of the mechanical model was acceptable and using the accepted motion of the mechanical model to compare the behavior of the PLC code relative to the accepted motion by playing the PLC code with a PLC emulator. In ThermaView, there the PLC emulator does not replicate a motion of a mechanical model. .As such, there is no suggestion or motivation in the art to combine Kanai et al. and ThermaView together.

The present invention sets forth a unique and non-obvious combination of a method of emulating machine tool behavior for a programmable logic controller logical verification system for manufacturing a motor vehicle that allows a controls engineer to compare the behavior of the PLC code to accepted motion of a CAD model as part of PLC logical verification system and uses transformational arrays that allows a different software technology to do the rendering; one that requires much less computer resource per unit of machine; and allows a controls engineer to examine the visual behavior of an entire manufacturing line, thereby verifying some of the more difficult controls problems such as inter-workcell behavior through observation of the visual operation of multiple concurrent workcells. The references, if combinable, fail to teach or suggest the combination of a method of emulating machine tool behavior for a programmable logic controller logical verification system for manufacturing a motor vehicle including the steps of constructing a mechanical model using a computer,

generating transformational arrays for a mechanical model using the computer, viewing motion of the mechanical model in a motion viewer based on the transformation arrays using the computer, determining whether the motion of the mechanical model is acceptable, replicating the motion of the mechanical model by generating a PLC code for the motion of the mechanical model using the computer if the motion of the mechanical model was acceptable, and using the accepted motion of the mechanical model to compare the behavior of the PLC code relative to the accepted motion by playing the PLC code with a PLC emulator as claimed by Applicants.

Further, the CAFC has held that "[t]he mere fact that prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification". In re Gordon, 733 F.2d 900, 902, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984). The Examiner has failed to show how the prior art suggested the desirability of modification to achieve Applicants' invention. Thus, the Examiner has failed to establish a case of prima facie obviousness. Therefore, it is respectfully submitted that claims 1 through 19 are allowable over the rejection under 35 U.S.C. § 103.

Obviousness under § 103 is a legal conclusion based on factual evidence (In re Fine, 837 F.2d 1071, 1073, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988), and the subjective opinion of the Examiner as to what is or is not obvious, without evidence in support thereof, does not suffice. Since the Examiner has not provided a sufficient factual basis, which is supportive of his/her position (see In re Warner, 379 F.2d 1011, 1017, 154 U.S.P.Q. 173, 178 (C.C.P.A. 1967), cert. denied, 389 U.S. 1057 (1968)), the rejection of claims 1 through 19 is improper. Therefore, it is respectfully submitted that claims 1 through 19 are allowable over the rejection under 35 U.S.C. § 103.

Based on the above, it is respectfully submitted that the claims are in a condition for allowance, which allowance is solicited.

Respectfully submitted,

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